MATLAB EXPO 2017

Simulink as Your Enterprise Simulation Platform

Dr. Mohamed Anas



Simulink as an Enterprise Simulation Platform

Simulating Spacecraft Communications for Deep-Space Missions

Dr. Deepak Mishra, Scientist/Engineer (SF)

Indian Space Research Organization



Challenge

- Integrating large multi-faceted project
- Simulation at multiple stages and in multiple domains to explore the problem
 Solution
- Leverage Simulink as a platform

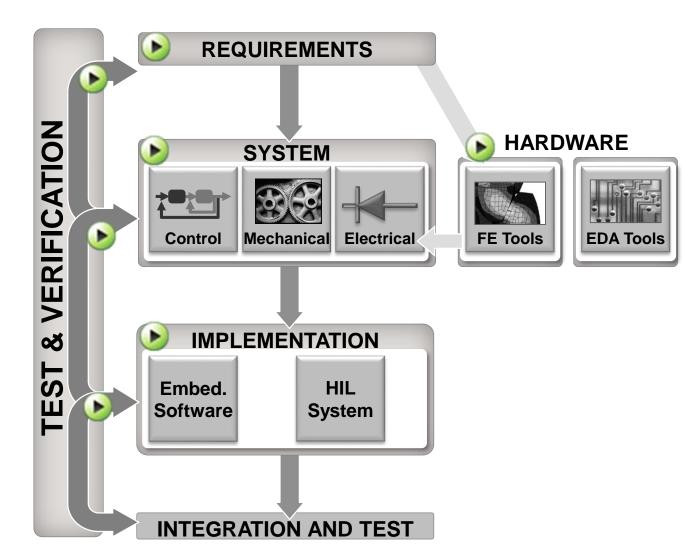


Enterprise Simulation Platform

- Enterprise Any size business or project
- Simulation Evaluating system behavior through computation
- Platform Scalable environment for multi-disciplinary collaboration

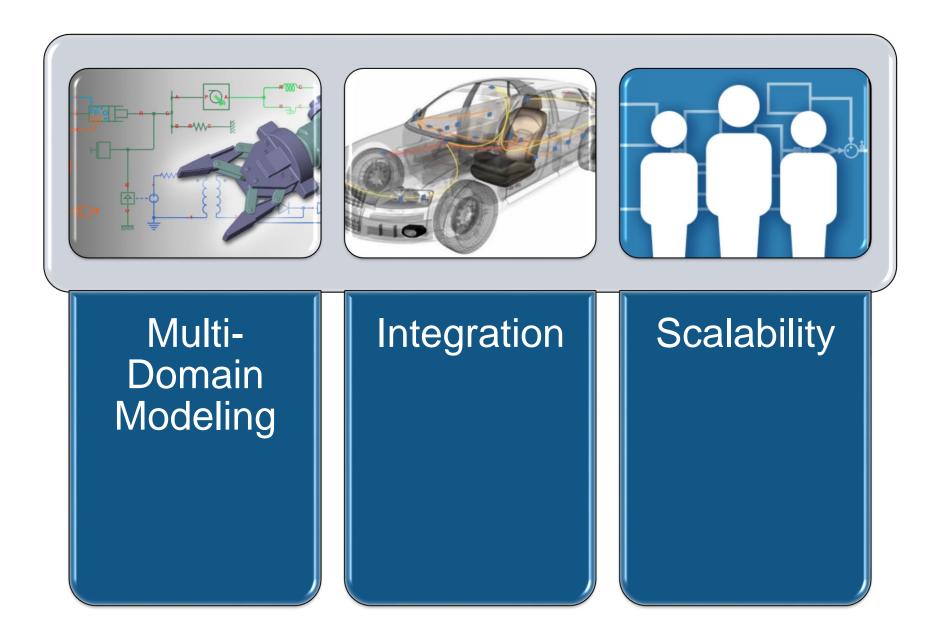


Model Based Design



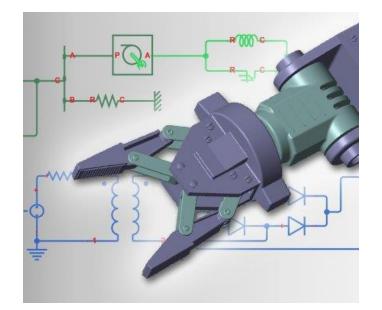


Enterprise Simulation Platform Enablers





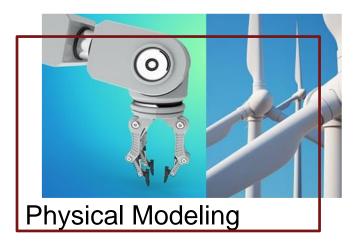
Multi-Domain Modeling

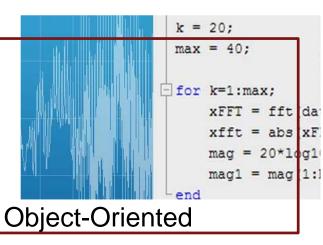




Multi-Domain Modeling in Simulink





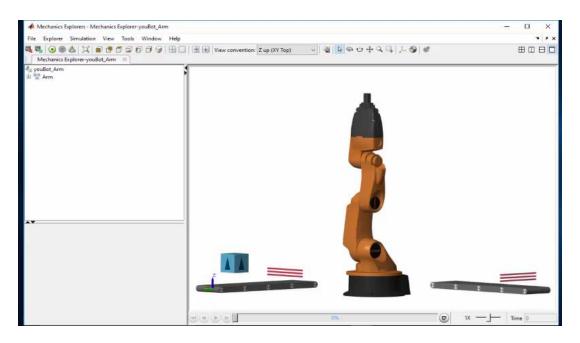


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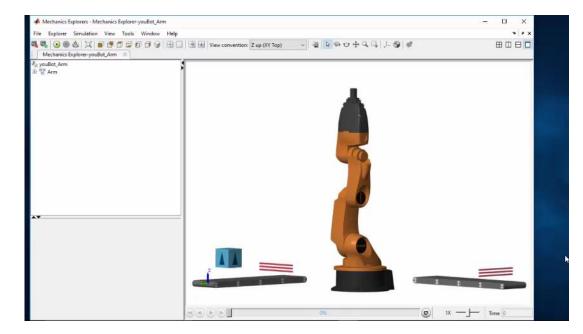


Robot Arm Multi-Domain Simulation

Without Network Model

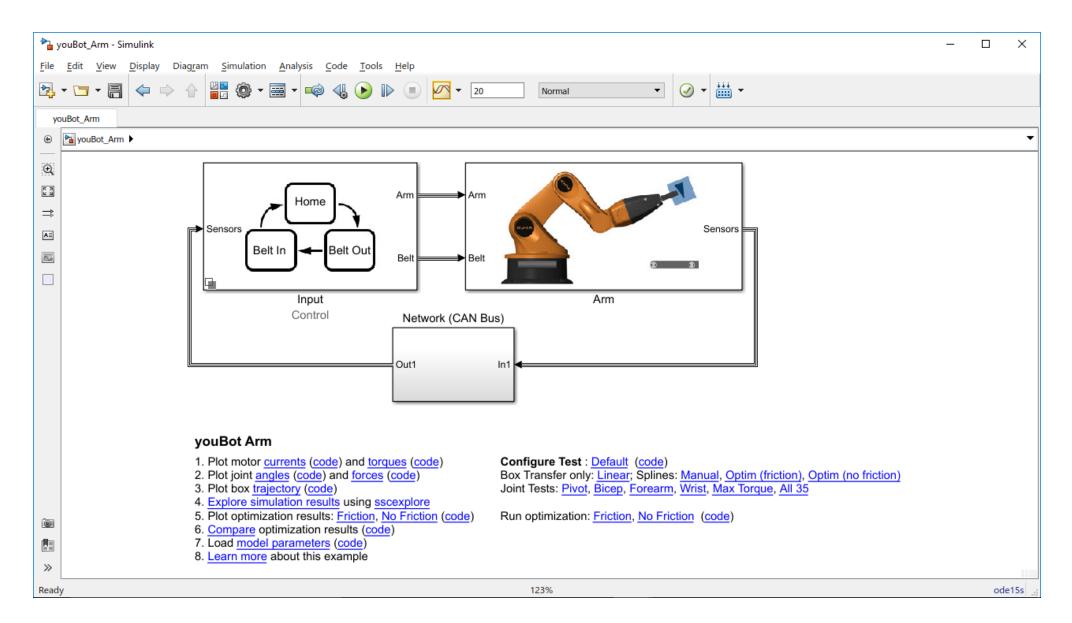


With Network Model



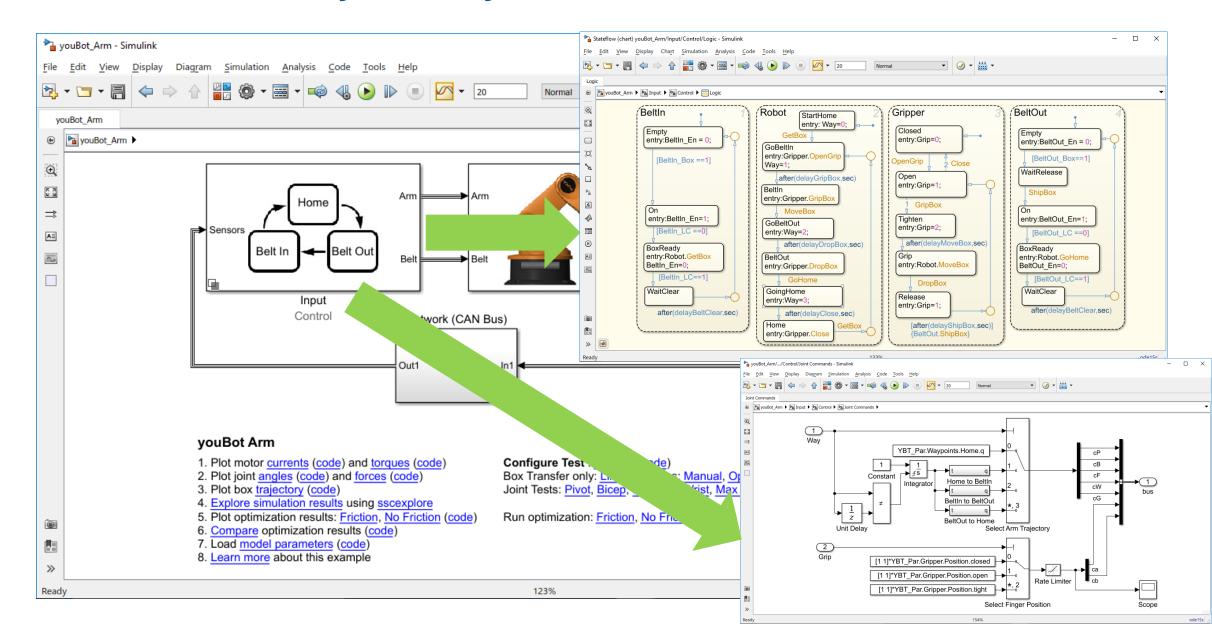


Multi-Domain Model



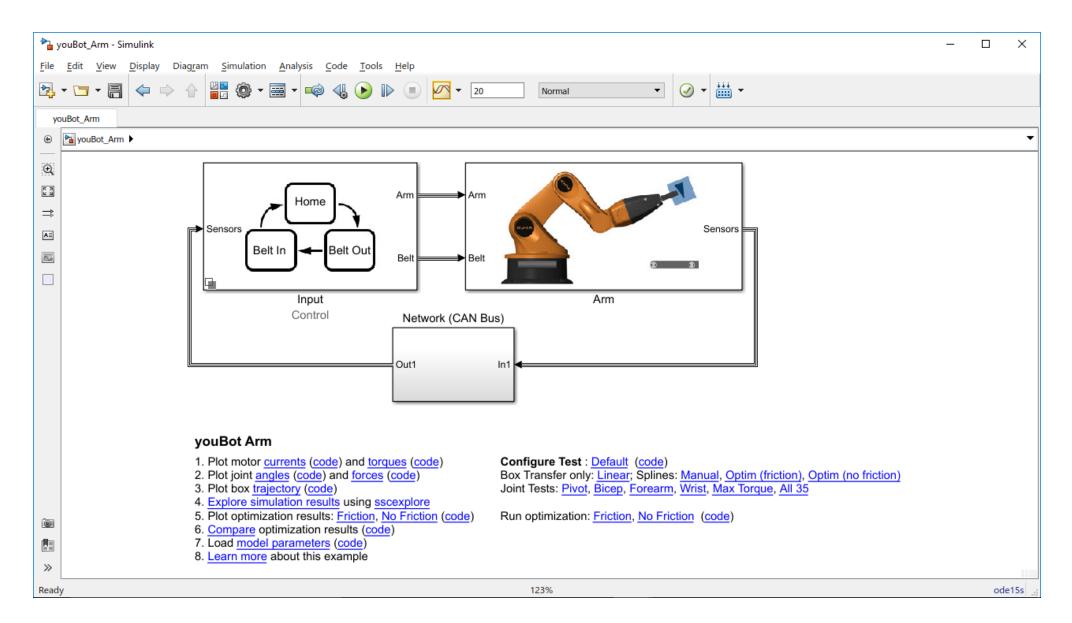


State Charts and System Dynamics



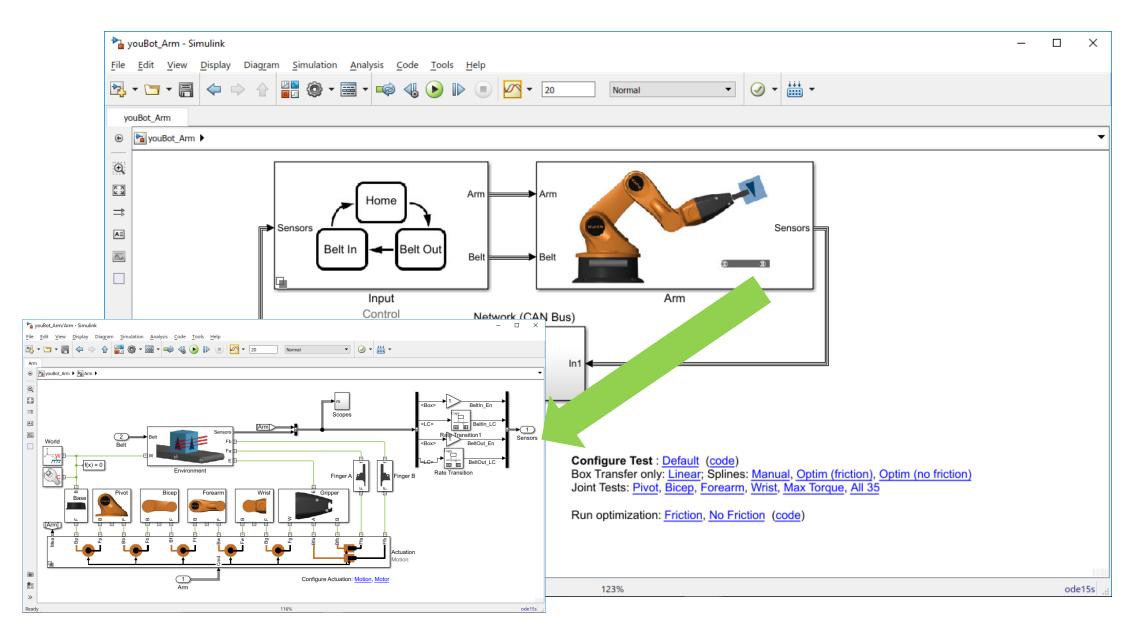


Multi-Domain Model





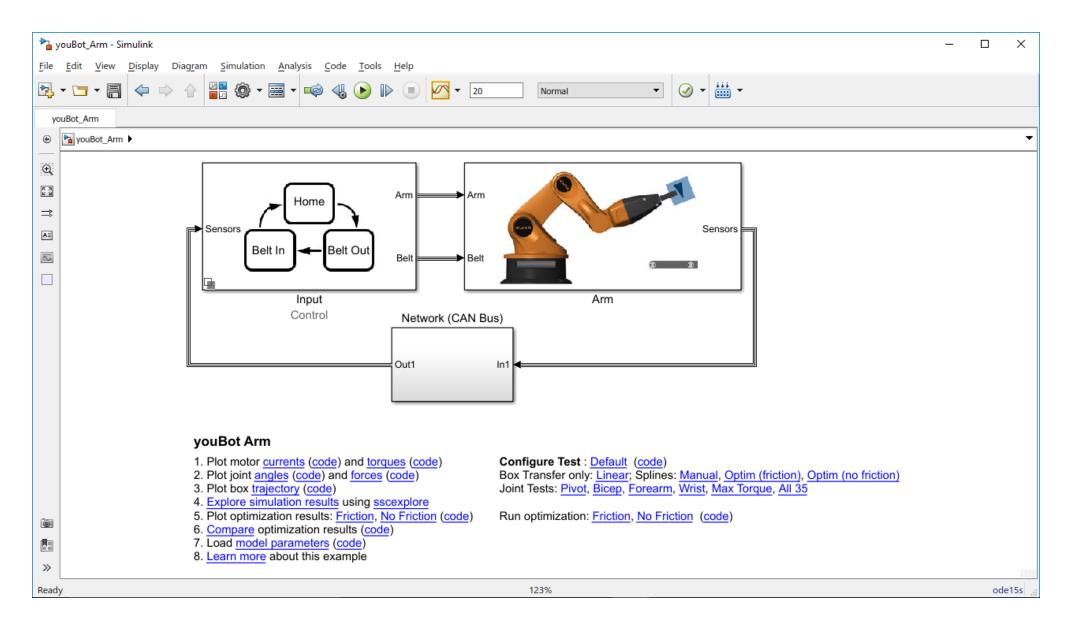
Physical Modeling



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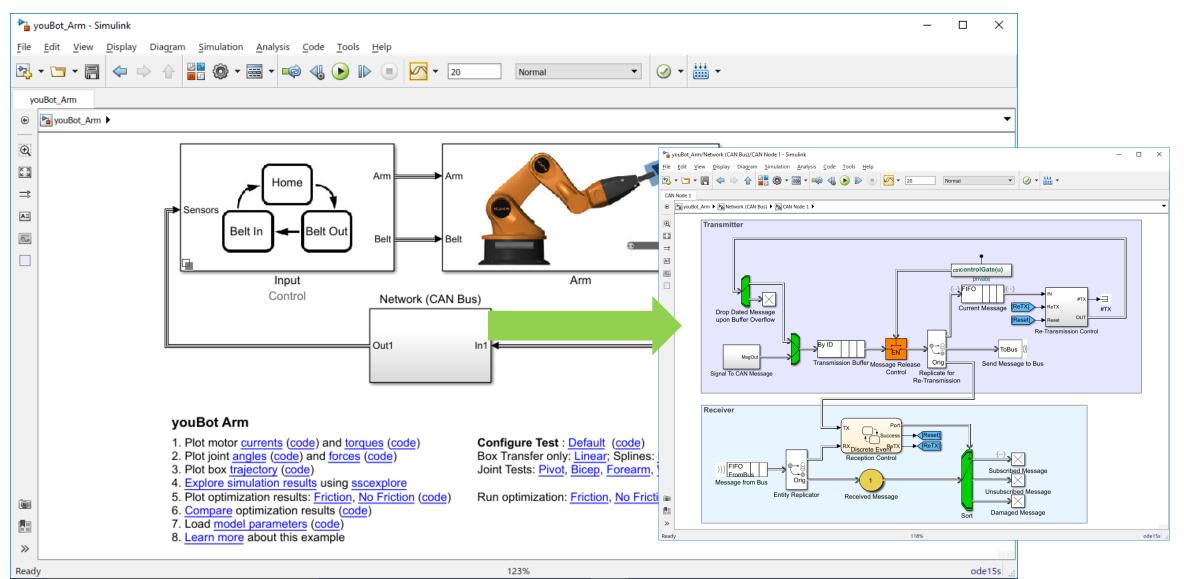


Multi-Domain Model





Discrete-Event Modeling



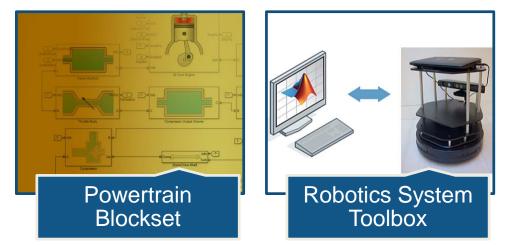
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Domain-Specific Blocksets and Toolboxes

• Simulink has numerous domain-specific tools, for example:





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Customer Success in Multidomain Modeling

ABB, Deltamarin, and VTT Simulate and Optimize Ship Energy Flows

Challenge

Increase the energy efficiency of large vessels

Solution

Use Simulink and Simscape to model, simulate, and optimize ship energy flow

Results

- Cost- and fuel-saving design improvements
- Testing costs reduced by tens of thousands of euros





Customer Success in Multidomain Modeling

"Simulink and Simscape enabled us to create a dynamic model of a complex energy system that spans several physical domains. By simulating this model, we can see how a new energy subsystem will perform before it is built, and provide customers with an accurate estimate of their return on investment."

Juha Orivuori, ABB



Solution

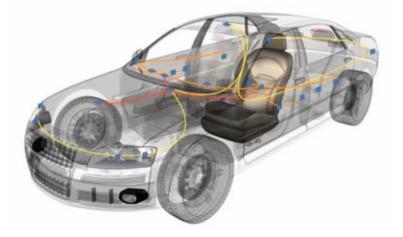
Use Simulink and Simscape to model, simulate, and optimize ship energy flow

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- Testing costs reduced by tens of thousands of euros



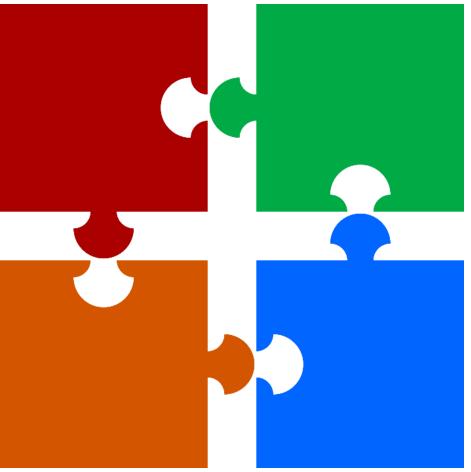
Simulation Integration





Disconnected Component Intellectual Property (IP)

Your IP exists in many forms and in many locations, making integration difficult

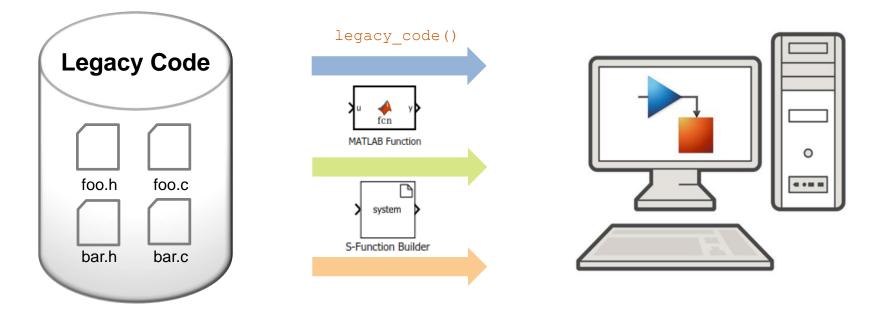


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Integrating Your Code

• Multiple ways to reuse your legacy code with Simulink

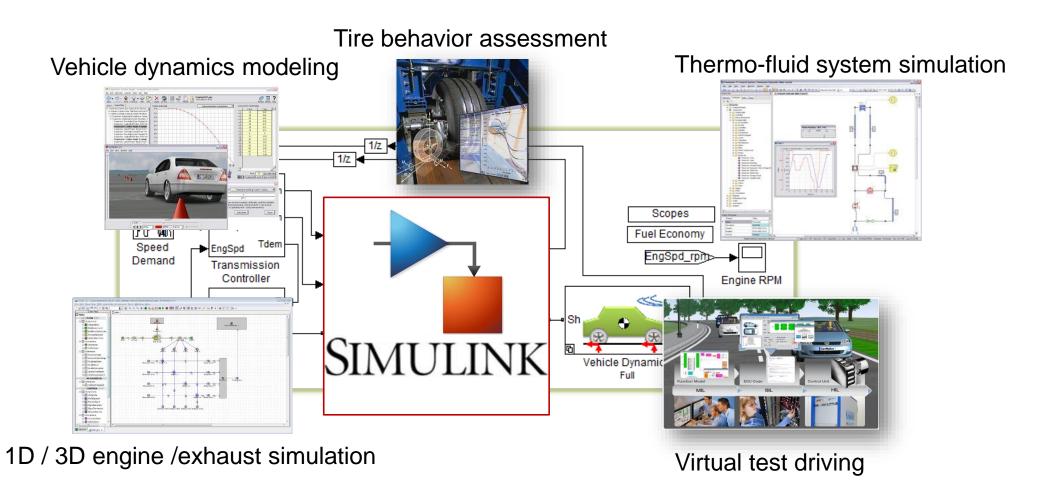


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Integrating Third-Party Simulation Tools

Mature and extensive APIs for third-party tool integration





Partner Ecosystem

Numerous partners provide interface to Simulink

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Third-Party Pro	ducts &	Services	CarSim, TruckSim Simulation of the vehicle	, BikeSim e dynamics for SIL, HIL, and D	riving Simulators	Mechanical Simula Corporation	tion		
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Customer Success in Simulation Integration

Develop Integrated Vehicle Safety Applications Siddharth D'Silva, Principal Engineer Autoliv



Challenge

Design and validate safety-critical algorithms before implementation

Solution

Leverage Simulink as a platform by integrating third-party software



Customer Success in Simulation Integration

"Seamless integration with third party software solutions enables rigorous development in a safe environment. For application engineers or system engineers, it is very useful that you can export these complex third-party tool functionalities in the form of S-functions and run co-simulation."

Siddharth D'Silva, Autoliv



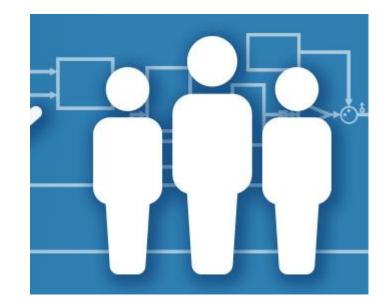
Results

- Industry first integration of stability control inertial sensor into airbag control unit
- Restraint control module software development time reduced by 30%

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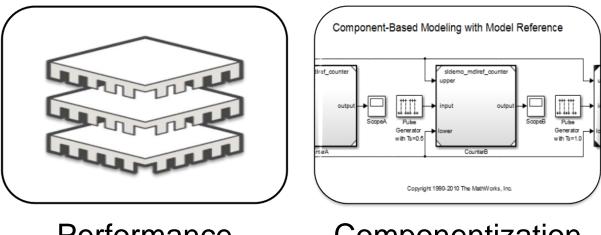


Scalability



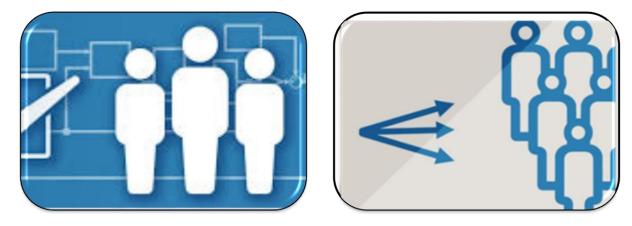


Scalability Challenges



Performance





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Team Workflows

Sharing



Performance Scalability

Easy scalability to multicore or cluster/cloud computation environment

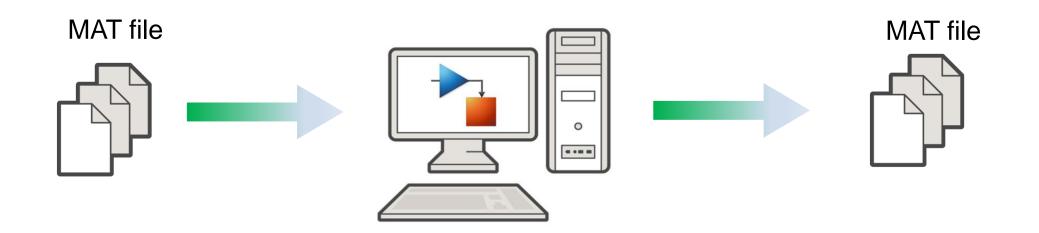
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Performance



Performance Scalability

- Big data workflow
 - Processing large amount of simulation inputs / outputs

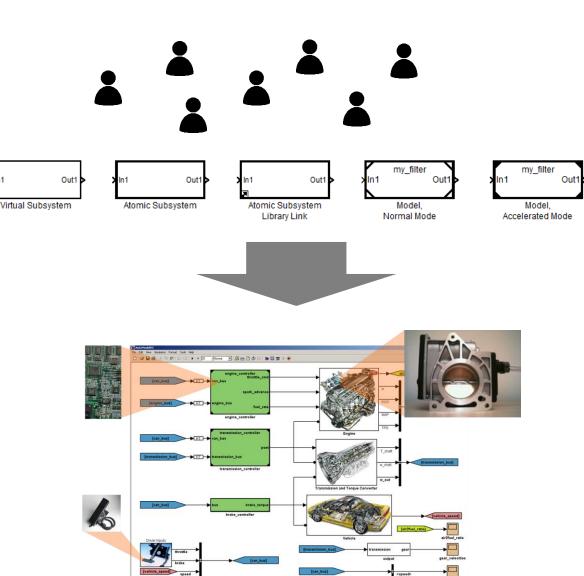




Complex Design Development through Componentization

- Supporting team workflows
 - Faster modular development
 - More effective verification
 - Increased reusability
- Improving performance
 - Incremental loading and code generation
 - Simulation speed
 - Memory usage

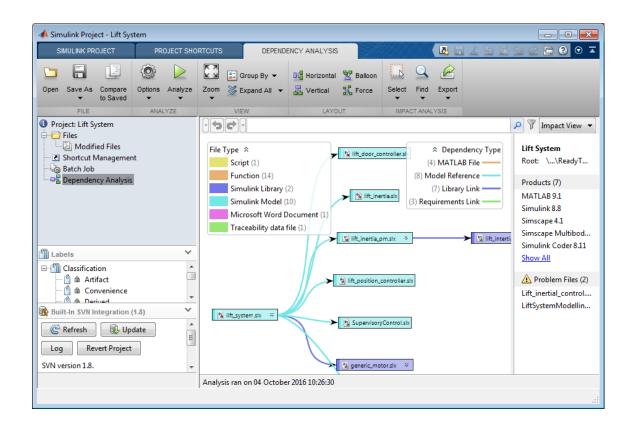
Componentization





Capabilities Enabling Team Workflows

- Source control
- Design comparison and merging
- Dependency analysis
- Task automation





Source Control Integrations

 Microsoft Team Foundation Server (TFS) integration available now from MathWorks File Exchange







Team Workflows



Integrating Work from Different Engineers via Merge

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Team Workflows



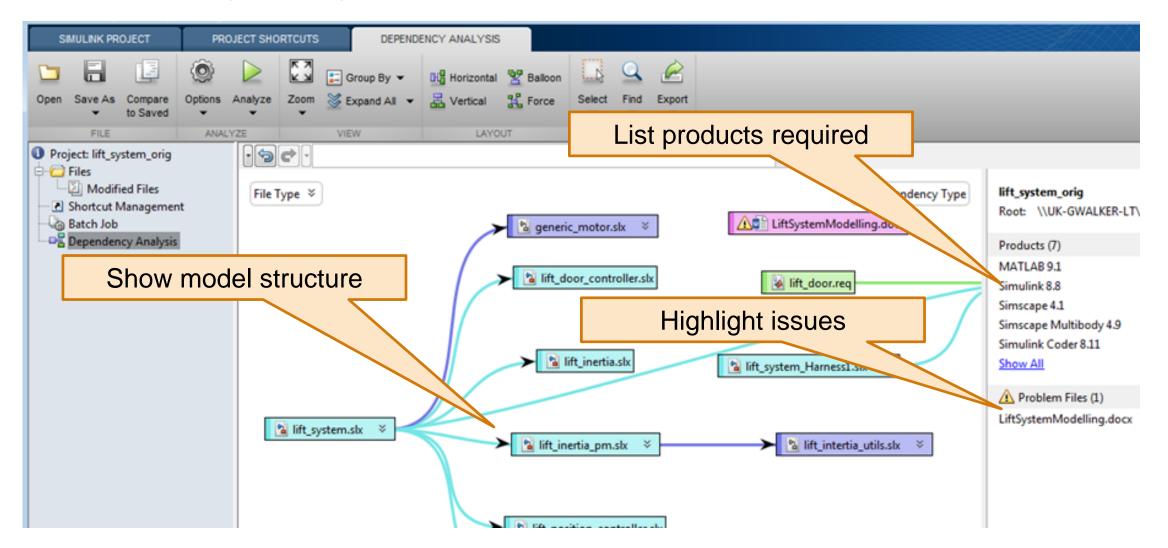
Dependency Analysis – Modular Development

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Dependency Analysis – Modular Development





Task Automation – Configuring Project Environment

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- Robustly configure the team environment
- For everyone
- Automatically

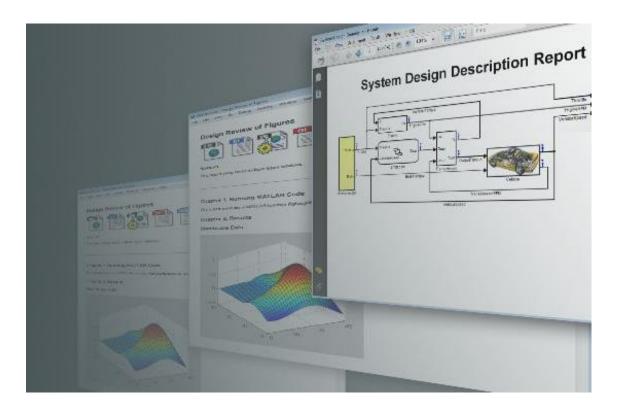


Sharing Outside Your Team



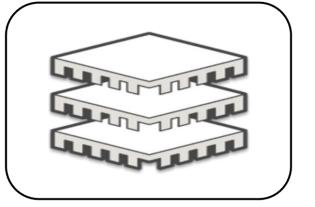
Model Protection (IP Management)

Reporting and Documentation

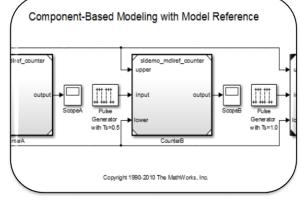




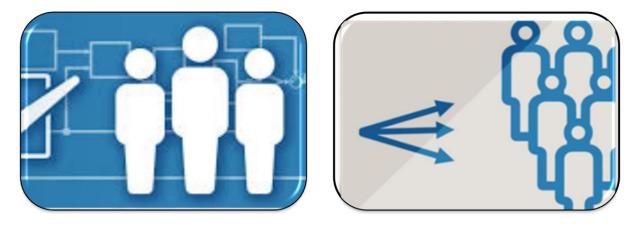
Simulink Addressing Scalability Challenges



Performance



Componentization



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Team Workflows



Simulink as Enterprise Simulation Platform

"There is no such tool, which gives the simulation environment as well as the hardware verification and validation. In a single environment, I am getting these together. **That is why I use MATLAB and Simulink.**"

Dr. Deepak Mishra, Indian Space Research Organization

